Concerning Handsaws.

SPEAR & JACKSON

THE WORLD'S OLDEST SAWMAKERS

AETNA WORKS, SHEFFIELD 4

2006 Peter Evans

Steel Melting at Aetna Works : Teeming or pouring the special analysis chrome-vanadium steel for your Spearior saw, the first step in a manufacturing journey twenty-seven processes long.

Concerning Handsaws.

SOME HINTS ON THEIR CARE & MAINTENANCE

compiled by

SPEAR & JACKSON

AETNA WORKS SHEFFIELD 4, ENGLAND

with the help of

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Here is a new edition of Spear & Jackson's "Concerning Handsaws."

Issued by a firm engaged for two hundred years in making saws of all kinds in Britain's famous steel city, this booklet shows every user of hand and back saws how to take pride in these excellent tools and maintain them as they deserve. Everyone, from the beginner to the craftsman, will find here helpful information simply explained and based upon a long experience.

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HOW YOUR SAW WORKS

Wood consists of a mass of closely packed fibres all lying in one direction, " along the grain of the wood." Whenever a saw-cut is made in a piece of wood, either along or across the grain, these fibres must be severed by the saw teeth.

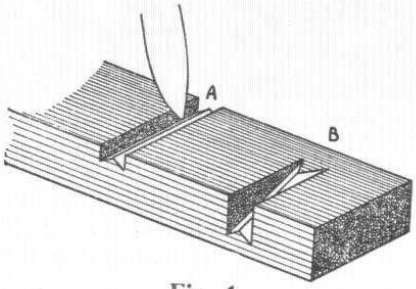

Fig. 1

If a knife is used to make two cuts about 1/16 in. apart across the grain of a piece of wood (A, fig. 1), the fibres left between the cuts are very short and crumble away as the cuts are deepened. The teeth of a *cross-cut saw*, specially designed for cutting *across* the grain of wood, are so arranged that they do, in fact, cut two knife lines close together in this way. The centre fibres crumble and are carried away as sawdust in the gullets between the teeth. The kerf or saw-cut thus produced allows the blade to sink into the wood as the cut deepens, (B, fig. 1). In fact, the saw teeth act like two series of pointed knives, one behind the other, (figs. 2 and 2a).

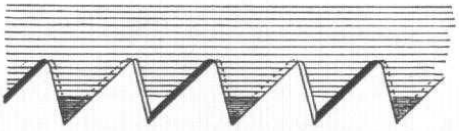

Fig. 2

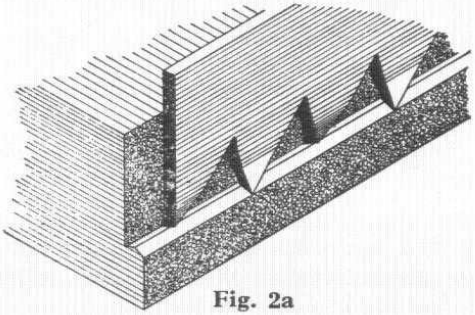

Fig. 2a

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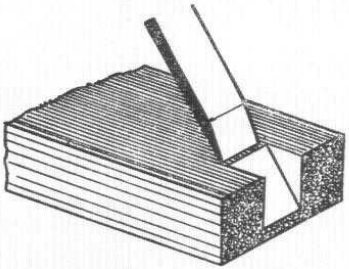

Fig. 3

When a saw-cut is made *along* the grain of the wood, a *rip-saw* is needed. To sever the fibres the teeth of the saw must now make cuts at right angles to the blade, like chisels, (fig. 3). The saw teeth are thus formed into two series of chisels, one behind the other, (figs. 4 and 4a).

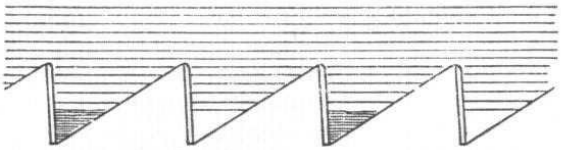

Fig. 4

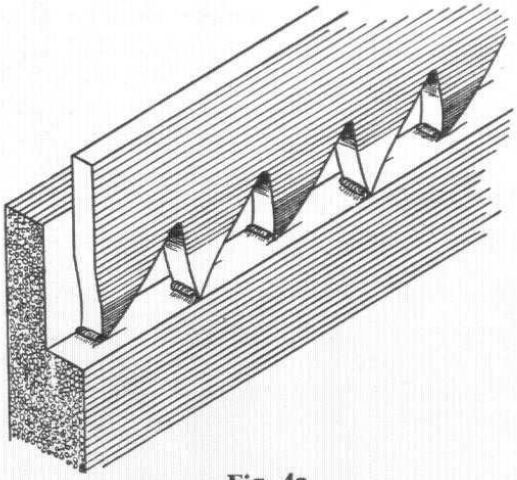

Fig. 4a

To prevent the saw from jamming in the saw-cut, the teeth are "set", i.e., alternate teeth are bent outwards to make a kerf just wide enough to clear the blade of the saw, (fig. 5).

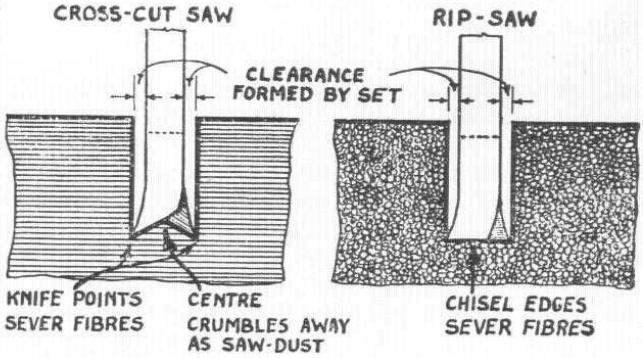

Fig. 5

To improve this clearance, best quality saws are "taper ground." The blade is of uniform thickness along the toothed edge and near the handle, but the thickness of the plate or blade is gradually reduced from the teeth towards the back edge and from the handle towards the point, (fig. 6).

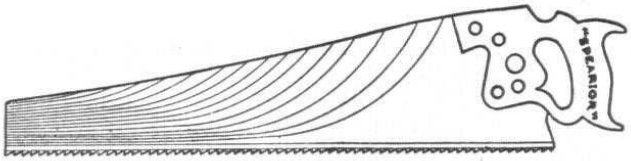

Fig. 6

HOW TO MAINTAIN YOUR SAW IN PERFECT WORKING ORDER

A saw in really bad condition will need the following operations, *in this order:*

1. Topping.
2. Shaping.
3. Setting.
4. Sharpening.

But, just as a chisel may be honed many times before regrinding becomes necessary, so a saw can be re-sharpened several times before the set is worn away. A good rule when sharpening a saw is "little and often."

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Topping

When the teeth of a saw are of different heights, (fig. 7a), or when the edge has worn hollow, (fig. 7b), the saw must be "topped" to level off any unevenness. Use a second-cut mill file, 10 in. long, or any well worn flat file. Fix the saw in a saw-vice, hold the file quite flat and run it along the whole length of the saw. Should the saw have a very uneven edge it is unwise to top it completely before beginning the shaping, as, with more than about a third removed from the tops of the most prominent teeth, it becomes difficult to retain the original spacing when performing the next operation of shaping (*described on pages* 7-8). When the edge is badly out of true, top lightly so as to file only the highest teeth. Shape these and top again, and continue shaping and topping alternately until all the teeth are reached.

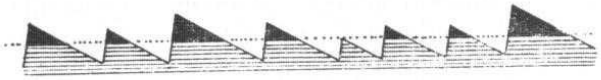

Fig. 7a

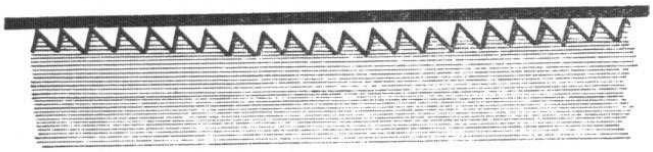

Fig. 7b

When topping, care should be taken to keep the file quite flat (fig. 8), otherwise the edges of the teeth will become rounded and thus difficult to sharpen correctly. If holding the file quite flat and square with the saw blade is difficult, make a 'topping clamp,' (fig. 9).

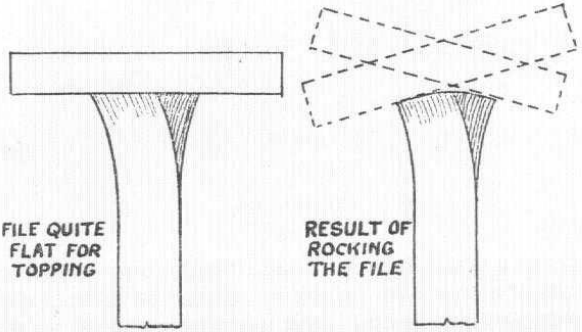

Fig. 8

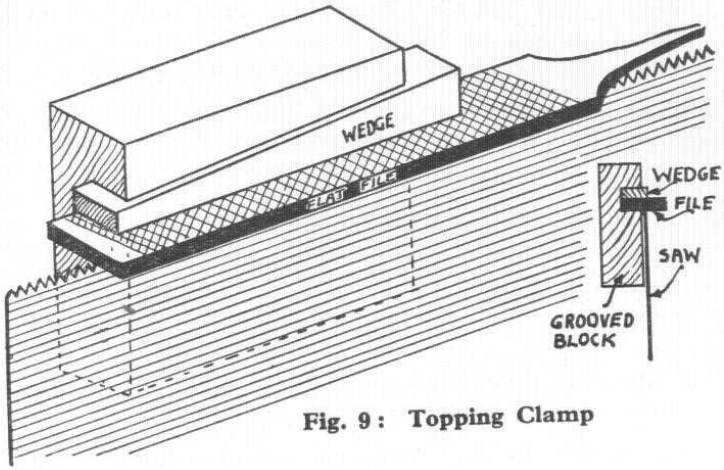

Fig. 9: Topping Clamp

Shaping

In shaping, the teeth of your saw are all filed to a uniform shape and size with a taper or slim taper saw file, using these sizes :

Saw, points per inch Rip	6	7-8	10-12	
Taper saw-file, length	8″	7″	6″	6″ (slim taper)

For best results the width of the file face should be just over twice the depth of the saw teeth, (A, fig. 10). If the file is too narrow, (B, fig. 10), two of its faces may become completely worn, so that when the file is turned over only one new face is brought into action, the other being already worn.

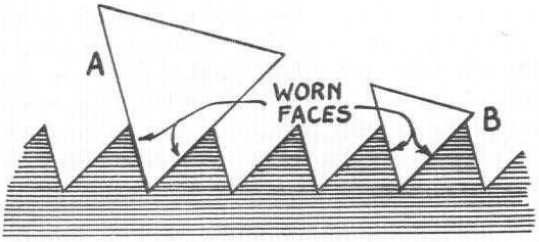

Fig. 10

Fix the saw in the saw-vice so that not more than $\frac{1}{4}$ in, of the saw projects above the cheeks of the vice. Place the file in a gullet between two teeth and press it down firmly with the left hand so that it assumes the correct pitch of the teeth. Grip the file handle in the right hand with the thumb on top and finger alongside and maintain this grip until the shape is complete.

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The same *pitch* will then be given to each tooth. *Pitch* is the angle at which the leading edge of the tooth leans forward, as much as 14° for a cross cut saw, but a much lesser angle for the rip-saw, (fig.11).

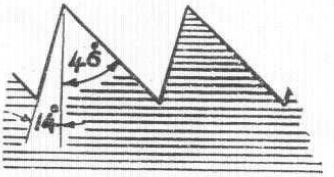

Fig. 11

The teeth are shaped by filing straight across the saw at right angles, and with the file held horizontally, (fig. 12).

File each gullet carefully and accurately with slow steady strokes of the file.

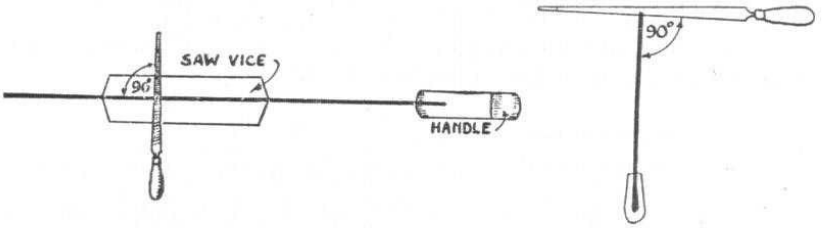

Fig. 12

When shaping is completed, all flats formed on the tips of teeth during topping will have just been removed and each tooth brought to a point. The teeth should now all be quite even in height, all of the same shape, and the front and back of each tooth should be sloping at the correct angle, (fig. 11). *Do nothing to bevel the teeth. This is done during the final sharpening process after the teeth have been "set."* Teeth should be shaped as uniformly as possible so that each tooth will play its proper part in the cutting action—this uniform shaping of each tooth is a vital factor in the ease with which a saw does its work.

Setting

The most common mistake made in reconditioning of saws is to give the teeth too much "set." Ninety per cent of saws returned for expert re-conditioning at Spear & Jackson's have been over-set. Teeth well set will cut a kerf wide enough to give clearance for the blade ; the *least* amount of set to give this clearance is the *right* amount. Rarely will the kerf need to be more than 1½ times the thickness of the blade, (fig. 5). Greater set than this makes the saw less efficient

because more effort has to be expended in producing an unnecessarily wide kerf and also more wood is wasted as saw-dust. " Spearior " taper ground saws give clearance with extremely little set.

The nature of the wood to be cut will affect the amount of set. If the wood is wet the saw does not cut so cleanly and so the teeth must be set more widely than for dry wood.

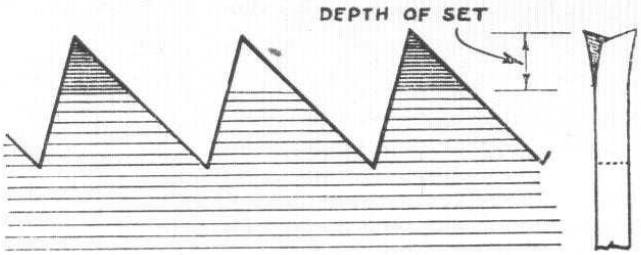

Fig. 13

Teeth should not be set for more than half their depth, (fig. 13). Any attempt to set them deeper may cause distortion of the blade at the roots of the teeth, cracking of the blade at the bottom of the gullets, or even the breaking out of some teeth.

Undoubtedly the best method of setting is that used by the manufacturers. They use a fine cross pean hammer and saw anvil consisting of a piece of steel with a rounded edge and some form of guide or stop so that the teeth overhang the bevel by the correct amount, (fig. 14a). The saw blade rests on the anvil. The guides are adjusted so that *no more than half* the depth of the tooth projects over the bevel on the anvil. The first tooth is set with two or three light blows with the hammer rather than with one heavy one. Alternate teeth along the whole length of the saw are then set in the same way. The blade is then turned over to set the intermediate teeth. Take care to set the teeth to their original sides. Bending teeth first one way and then the other may break them.

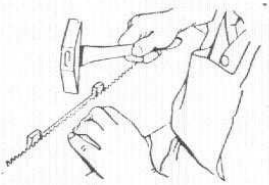

Fig. 14a

The plier type of saw set, such as the ' Eclipse ' (fig. 14b), will also set saws satisfactorily. The pliers are operated by placing them over a tooth and compressing the handles. A plunger pushes the

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tooth over against an anvil. To suit each particular saw the amount and the depth of set are both automatically controlled by the adjustment of the anvil and depth stop. The old type of saw-set—a steel blade with a number of slots cut in it—will not usually produce an even set and is not recommended. It may however be employed successfully for setting saws used for very coarse work.

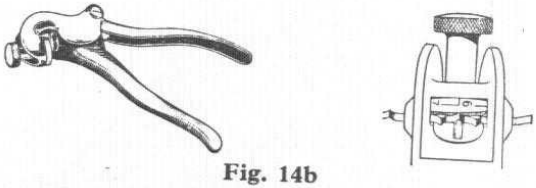


Fig. 14b

Whatever the method, a uniform set must be produced along the whole length of the blade, each tooth being bent by exactly the same amount. A saw will not work true to a line unless the teeth on both sides do the same amount of work. Slight irregularities of set are removed by side dressing. Lay the saw flat on the bench and then run an oilstone slip lightly over the teeth to reduce any that are too prominent. Turn the saw over and repeat on the other side.

A saw that consistently wanders away from the line of cut most probably has more set on one side than on the other. A careful side-dressing with the oilstone slip will cure the trouble.

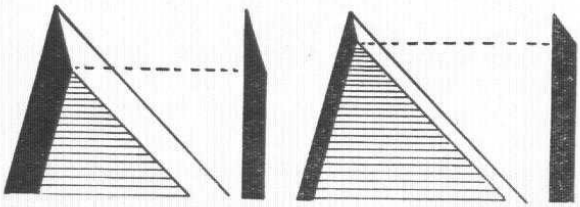
Sharpening

The final sharpening of the saw teeth is done in one of two ways according to whether the saw is to be used for cutting across or along the grain.

Cross-cut Saws

The teeth must be bevelled with a file to produce knife-edges to sever the fibres of the wood.

If this bevel is made too long a very thin edge is produced on the tooth, (A, fig. 15). Though this cuts excellently it will very quickly be worn away—particularly on hardwoods—so a shorter bevel is better for general use, (B, fig. 15).



A Fig. 15 B

Fix the saw so that not more than $\frac{1}{4}$ inch of the blade projects above the cheeks of the saw vice. In figs. 16 and 17 the handle of the saw is assumed to be on the *right* of the vice.

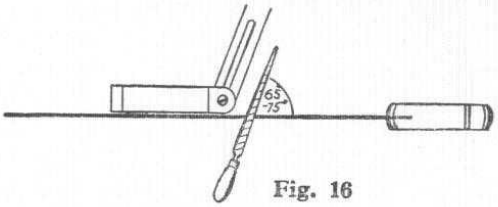


Fig. 16

Next, "top" the saw very lightly. This makes certain that all the teeth are the same height and puts a "shiner" on the tips of the teeth to help in the sharpening process.

Place the file to work on the front edge of the first tooth set towards you, (A1, fig. 17). It will then also be working on the back edge of the tooth on the left of the file, this tooth being set away from you.

Move the file handle over to the left until the file makes an angle of 65°—75° with the line of the saw blade, (fig. 16). This angle *must* be maintained throughout. Keeping the file perfectly horizontal, give each tooth two or three slow steady strokes of the file. When half of the "shiner" is filed away the file is transferred to *the next gullet but one*. The front edge of the tooth set towards you is being filed each time, (A2, fig. 17). Continue to the end of the saw, filing in each *alternate* gullet.

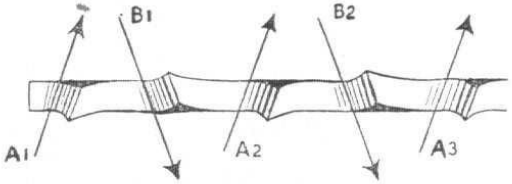


Fig. 17

When you reach the end of the saw, reverse it in the saw-vice. The handle is now on the *left* of the vice, (fig. 18). Repeat the filing on the front edge of the teeth set towards you, i.e., in the gullets which were missed the first time, (B1, B2, in fig. 17). The file handle must be swung round to the right so that the filing is again done towards the saw handle. Maintain the original angle of 65°—75°, (fig. 18), and keep the file perfectly horizontal. The filing is completed when the other half of the "shiner" on each tooth just disappears. The teeth should then be sharp.

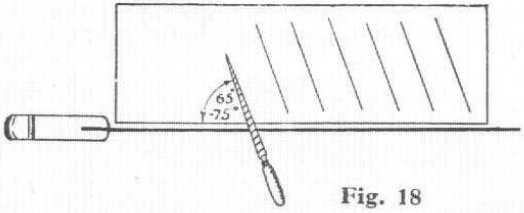


Fig. 18

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Rip Saws

The teeth of a rip saw must be filed to produce the chisel edges which sever the fibres of the wood, (fig. 19).

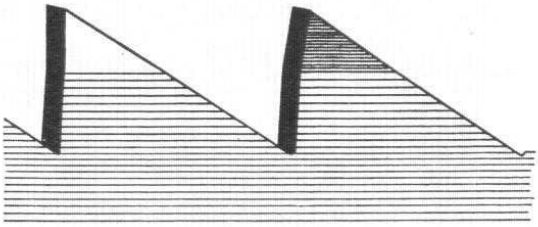

Fig. 19

Fix the saw in the saw-vice (see *Sharpening Cross-cut Saws*, page 10), with the handle to the right. Give the teeth a very light topping to produce the shiners. The sharpening procedure is the same as for the cross-cut saw *except* that in this case the filing *must* be done at *right angles* across the saw, (fig. 20).

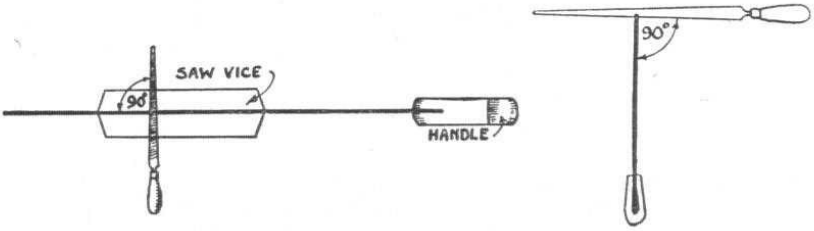

Fig. 20

File each alternate gullet, A1, A2, etc. (fig. 21), then reverse the saw in the vice so that the handle is now to the left. Then file the intermediate teeth which were missed on the first filing, (the file will now be at B1, B2, etc. in fig. 21). The file *must* be quite horizontal at all times, (fig. 20).

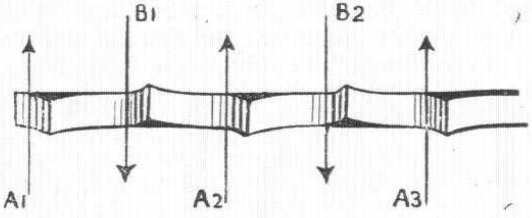

Fig. 21

After sharpening, side-dress the saw very lightly with an oilstone slip to remove any burr caused by the file.

HOW TO CHOOSE YOUR HANDSAW

A saw with large teeth and consequently large gullets or spaces between teeth is better for cutting soft wood. The soft timber offers little resistance to the saw and so allows each tooth to bite deeply. A large gullet is needed to carry the sawdust out of the kerf. Hardwood on the other hand, offering a greater resistance, needs more teeth to attack it. Since each tooth bites less deeply, less sawdust is produced and thus a smaller gullet is permissible.

The length of a saw is measured along the blade and does *not* include the handle. The tooth size is measured as the number of *points* per inch. This always includes both outside points, (fig. 22).

The teeth should be sharp, uniform in shape, and evenly set.

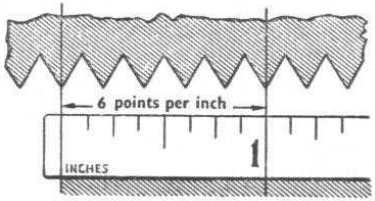

Fig. 22
6 points per inch = 5 teeth per inch.

Recommended Saws

Saw	Length	Points per Inch
Rip	26 in.	5
Cross-cut	24 or 26 in.	6, 7 or 8
Panel	20 or 22 in.	10

SOME NOTES ON MANUFACTURE

The most important factors in a saw are the quality of the steel and the correctness of its temper. Unfortunately, though inferior steel shows up in use, there is no way of telling when you buy. The only safe way is to buy your saw from a maker with a good name to protect.

Most makers produce saws of various qualities for different jobs (see *Choosing the right quality saw for the job*, page 19). The Spear & Jackson top quality saw, the *Spearior*, is intended for the craftsman willing to pay a good price for the best saw available. Hence the way the *Spearior* is made is an indication of quality in a saw—though many readers of "Concerning Handsaws" may never do work needing a saw so exceptional in every way.

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Steel

The steel for *Spearior* hand and back saws is made in an electric arc furnace and contains nickel, chromium, molybdenum and vanadium. The quantities of each of these elements in the steel is accurately checked by chemical analysis.

The steel itself is subjected to various tests before being accepted for the manufacture of saws. Inspection instruments used include an ultrasonic flaw detector which sends high frequency sound waves into the steel and records the echoes of these sound waves by means of a cathode ray tube. Flaws in the steel can be detected even if several inches below the surface.

Temper

Tempering of steel is the process of achieving a balance between hardness and toughness. A handsaw blade if brittle will easily fracture. Though the teeth maintain their sharp edge without frequent resharpening they tend to break off when being set. On the other hand, a soft saw blade will distort easily. The teeth will set without danger of breaking, but they will be too soft to maintain a sharp edge for long.

A well tempered handsaw will bend in a regular or uniform curve, springing back quite straight on being released, and ringing with a clear note when struck.

The exact degree of hardness is checked at intervals along the blade of each *Spearior* saw and micro-examination of blade sections, polished and etched, is a routine check that the steel is clean and the structure correct.

Grinding

Many handsaws for the handyman or amateur are ground to make the blade perfectly uniform in thickness. However, best quality craftsman's handsaws are " taper ground," so that they work with a small set, cut less kerf and take less driving. You can test the taper with a wire gauge. If the grinding has been well done, you will find that the blade tapers regularly from point to handle along the back and is uniform in thickness just above the teeth, (fig. 23).

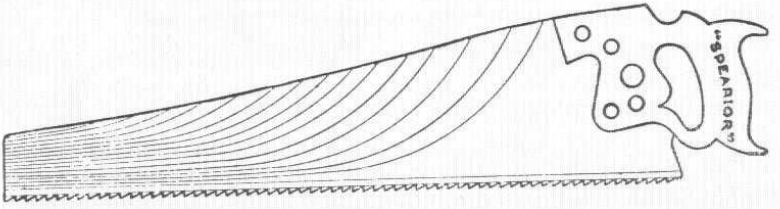

Fig. 23

Finish

If samples of steel with various surface finishes are exposed to damp, the steel with the highest polish provides the longest resistance to rust. So *Spearior* saws are given a mirror-like finish and are further protected against rusting by a new dry lacquer finish pioneered by the makers.

Handles

The handle should be of sound close-grained, hardwood, free from knots, and should fit tightly to the blade. Hold the saw in the working position and judge the balance. A good saw has a comfortable handle and its balance does not tire the wrist. The perfect balance of *Spearior* saws is obtained by setting the handle low on the blade end, at an angle that will produce a thrust half way along the toothed edge.

CARE OF SAWS

A rusted saw is unpleasant to use. It will not cut well and tends to bind in the kerf. Preserve the high polish of your new saw by keeping it in a dry place : give it a rub over with oil or vaseline after use (but avoid vegetable oils because they tend to become gummy). Should rust appear in spite of your precautions, remove it at once by applying paraffin and rubbing with *fine* emery cloth.

A saw is best hung by the handle when not in use. If left lying on the bench the teeth may suffer from contact with other tools, or the blade may become distorted. When carrying a saw with other tools protect the teeth by placing a 'guard' over them ; this could be in the form of a strip of wood as long as the blade with a slot in it to fit over the teeth. It is held in position by a loop of string.

Two frequent causes of damage to saws are vice jaws unlined with wood and sawing trestles that are too low. The wood lining of a vice should project well above the steel jaws. Sawing trestles should be high enough to prevent the point of the saw from striking the floor.

A saw in good condition needs no forcing. Correctly set and sharpened, it will work sweetly and efficiently. When the teeth lose their edge, sharpen them again. If you force the saw you may buckle it and a buckled blade is difficult to straighten. During manufacture the blade was 'tensioned' by hammering to expand the centre part of the blade, so keeping the edge in a state of tension. Hammering a buckled blade will probably make matters worse by spoiling the tensioning, so the safer course is to return the saw to the makers. If however the buckling is slight, you may be able to correct it by tapping with a blocking hammer while supporting the blade on a *wooden* block.

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HOW TO CHOOSE AND MAINTAIN YOUR TENON OR BACK SAW

This saw has a shorter and thinner blade than a handsaw and its teeth are much smaller ; it is so made for fine, accurate work. The most obvious difference, however, is the "back"—the fold of heavy steel or brass gripping along the whole length of the blade to keep the very thin blade stiff and rigid.

Because this saw is used for general work on the bench it needs to cut both with and across the grain. So its teeth are sharpened with a bevel, like cross-cut teeth, for cross-cut teeth will rip—though not so well as rip teeth—whereas rip teeth will not cross-cut cleanly.

Tenon saw teeth are pitched at an angle of 16° (fig. 24).

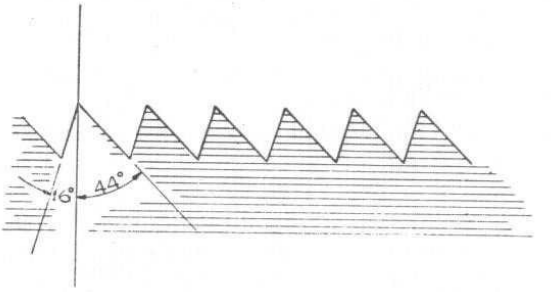

Fig. 24

Choosing a Tenon Saw

For carpentry	..	12 in.	long with	14	points	per inch.
„ cabinet work	..	10	„	16	„	„
„ dovetailing	..	8	„	20	„	„

(see page 18)

As in handsaws, the quality of the steel and the correctness of the temper are all-important factors which cannot be tested in the shop. The only real safeguard for the purchaser is to choose a saw made by a firm of repute.

Examine the saw. The cutting edge should be perfectly straight, the teeth evenly set and sharp, and the blade, right up to the root of the teeth, should be perfectly flat and without twist. Reject any saw that shows crimping of the blade at the root of the teeth.

The back should be in line with the blade as shown in A, fig. 25—not bent over as at B—and should grip the blade throughout its length Both back and blade should be firmly secured into the handle and be quite rigid. The handle of the *Spearior* tenon saw is "hand-tailored" to fit the blade and back.

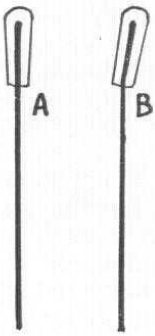

Fig. 25

Many craftsmen believe that brass-backed saws are superior to those with steel backs. The reason probably is that early manufacturers gave their better quality saws brass backs, so that a brass back became identified with good quality in the blade. Today, saws of the very best quality are often made with steel backs.

Care and Maintenance

The tenon saw is an accurate cutting tool. The blade and teeth are much finer than those of a handsaw and thus much more easily damaged. Maintain the teeth in good condition so that there is never any need to force the saw, because any forcing might cause distortion of the blade. A blade distorted in this way can often be corrected by supporting it vertically on a piece of wood and striking the back gently with a hammer, first at one end and then at the other, (fig. 26). This pushes the blade further into the fold of the back thus restoring it to its original position. A tension is imparted to the edge so that it is actually pulled straight. If this method is not successful, the back or the blade, or possibly both, have been twisted. The saw should be returned to the makers for skilled treatment.

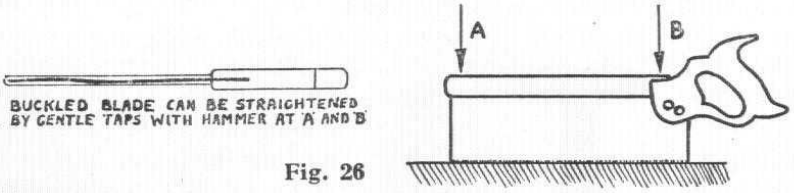

Fig. 26

Sharpening

The tenon saw is sharpened exactly like a cross-cut saw, but because the teeth are smaller greater care is needed to keep them perfectly even in size.

For 14—16 points use a 4″ or 4½″ slim taper file.
„ 12 „ 5″ „
„ 11 „ 6″ „

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THE DOVETAIL SAW

A smaller edition of the tenon saw, with a thinner blade and finer teeth, is used for cutting dovetails and other very fine and accurate work. It is 8 in. long with 20 points per inch. Its handle should be similar to that of a tenon saw, and not of the round bradawl type which is sometimes fitted. The beginner is prone to use a dovetail saw instead of a tenon saw for much of his bench work because it makes such a thin, clean kerf, and is easier to handle. This is unfortunate as it takes considerable skill to keep these finer saw teeth evenly shaped and spaced when resharpening. To keep these fine teeth even, make no attempt to bevel them. Though shaped like tenon saw teeth, they should be sharpened with the file held squarely to the saw as in sharpening a rip saw, (fig. 27). The teeth need no bevelling since all cuts made by a dovetail saw are along the grain, i.e., they perform a ripping action. When buying a dovetail saw, bear in mind the same points as with a tenon saw.

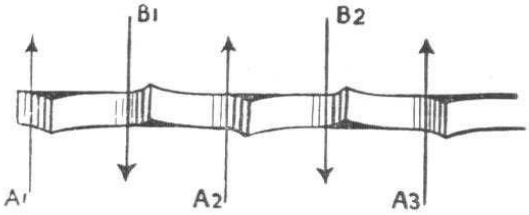

Fig. 27

HOME MADE SAW VICE

In fig. 28—A, shows the vice complete ; B, a side view ; C, the lever, and D, the lever on an iron staple.

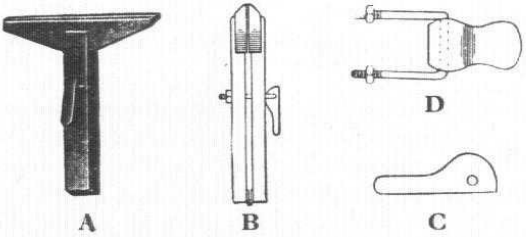

Fig. 28

The vice is made throughout from wood 3 in. wide × 1 in. thick. The jaws are 12 in. long and the uprights 14 in. The staple is made

from ¼ in. round iron bar, threaded to take the two nuts. Any smith will supply the bar and bend and thread it for you. At the bottom of the uprights is an ordinary 2 in. butt hinge. Pieces of leather or vulcanised rubber fastened inside the jaws will make the vice grip better.

As seen in C, the lever is eccentric in shape. When this is raised, the jaws of the vice open sufficiently to admit the saw blade easily. By forcing the lever into position as shown in A and B, the jaws are made to grip the saw tightly.

A simple bolt with a wing nut could be used instead of the lever and staple.

CHOOSING THE RIGHT QUALITY SAW FOR THE JOB

Spear & Jackson manufacture saws in four qualities. The incomparable *Double Century* is the best saw money can buy. (The 22 inch hand and 10 inch back saws are presentation boxed). Then comes the *Spearior*, the saw most tradesmen buy. This world famous marque is often recommended by the experienced joiner and handicraft teacher to the young man just out of apprenticeship. Such a saw, with its special alloy steel blade, taper ground and highly polished, specially devised balance and other refinements, is flying too high for many an amateur. The keen amateur woodworker will generally find a saw of second quality, like the *Sovereign*, serves his purpose well. Made of a slightly less expensive alloy steel, taper ground with fewer gauges "thin to back" and without actual *mirror*-polishing, the *Sovereign* is a good saw for anyone's money, and a saw of the quality described will give the conscientious workman or keen amateur good service. The householder or farmer who wants a saw of workmanlike quality will buy one of the *Cockerill* grade, a good robust saw for odd jobs. Flat ground and sharpened by machine, it is made of cast steel and will do its job well but requires more effort to use than the craftsman's tool.

The one grade of saw *never* to buy is the cheap article offered by a shopkeeper with no knowledge of tools and made by a firm you have never heard of. It may *seem* cheap—but may waste its own price in valuable timber the first time you use it.

Each quality of handsaw is partnered by an equivalent quality tenon saw.

VISUAL AIDS FOR SCHOOLS

Handicraft teachers are invited to write to Dept. P.R.S. 12, Spear & Jackson Ltd., Aetna Works, Savile Street, Sheffield 4, for particulars of filmstrips in colour, wallcharts and handiguides.

2006 Peter Evans

Spear & Jackson
"the world's oldest sawmakers"

Spear & Jackson have been making saws in Sheffield since 1760—and descendants of the founders still control the fortunes of this centuries-old concern.

Aetna Works — where *Double Century*, *Spearior* and other saws are made—is a fascinating mixture of the old and the new. Here on the one hand, you can see the very latest electric furnaces and scientific testing devices—including the first instance of automation in a factory of this type. Yet, over there, a craftsman sets the teeth of a *Spearior* saw by hand with a hammer in an old-fashioned way that has never been excelled.

You may know Spear & Jackson already without realising it. They make the famous *Neverbend* range of garden tools. What the *Spearior* is to the craftsman joiner, the standard *Neverbend* tool is to the professional nurseryman and really experienced and enthusiastic gardener.

Other Spear & Jackson products that you may come across in factory, shop and home include :

Spearfast Tubular Frame Saws.

Mermaid Circular Saws for Wood.

Spearseg Metal Cutting Saws.

Machine Knives, Ground Flat Stock and Alloy Steels.

SPEAR & JACKSON'S STANDARD PATTERNS, SIZES AND POINTS

HANDSAWS

PATTERN	Boxed in Points	18″	20″		22″			24″			26″				28″	Disc and Sheath Colour
		8	8	10	8	10	12	6	7	8	6	7	8	Rip.	Rip.	
P200 'DOUBLE CENTURY'	Singly					√				√		√				Royal Purple
R88 SPEARIOR	½ Doz.			√	√	√	√	√	√	√	√	√	√	√	√	Red
G179 SOVEREIGN	½ Doz.			√		√			√	√	√	√	√	√		Green
B99 COCKERILL	½ Doz.	√	√	√	√	√		√	√	√	√	√	√			Blue

√ Spear & Jackson standards

BACKSAWS

PATTERN		Boxed in	8″	10″	12″	14″	Sheath Colour
P201	'DOUBLE CENTURY' Brass Back	Singly		√	√		Royal Purple
R52	SPEARIOR Brass Back	½ Doz.	√	√	√	√	Red
R46	SPEARIOR Steel Back	½ Doz.	√	√	√	√	Red
R52A	SPEARIOR Dovetail Brass Back	½ Doz.	√				Red
G53	SOVEREIGN Brass Back	½ Doz.	√	√	√		Green
G47	SOVEREIGN Steel Back	½ Doz.	√	√	√		Green
B22	COCKERILL Steel Back	½ Doz.	√	√	√		Blue

√ Spear & Jackson standards

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